AMENDMENTS TO THE CLAIMS

1   1.   (Currently amended) A network device-based method comprising:

2   determining and retaining, upon receiving acknowledgement of receipt of new data,

3   ·an excess number of duplicate acknowledgements, wherein the excess number

4   of duplicate acknowledgements is a number that represents an amount of

5   duplicate acknowledgements and is based upon a count of consecutive

6   duplicate acknowledgement packets; and

7   taking a network packet transmission recovery action based upon said excess number

8   of duplicate acknowledgements.

1   2.   (Previously amended) The network device-based method of Claim 1 further

2   comprising:

3   determining whether a congestion window is inflated prior to deciding whether to

4   determine said excess number of duplicate acknowledgements.

1   3.   (Original) The network device-based method of Claim 1 wherein a value of the

2   excess number of duplicate acknowledgements is a count of bytes in the duplicate

3   acknowledgements used to determine the excess number of duplicate

4   acknowledgements and wherein said taking a network packet transmission recovery

5   action further comprises:

6   deflating a congestion window upon said value of said excess number of duplicate

7   acknowledgements in bytes being less than a number of bytes in a

8   transmission control protocol sender segment.

1   4.   (Original) The network device-based method of Claim 1 wherein said taking a

2   network packet transmission recovery action further comprises:

3   optimizing a size of a congestion window to match a reduction in a quantity of

4   unacknowledged data upon said excess number of duplicate

5   acknowledgements being greater than a TCP sender segment.

1   5.   (Original) The network device-based method of Claim 1 wherein said taking a

2   network packet transmission recovery action further comprises:

3   comparing said excess number of duplicate acknowledgements with a duplicate

4   acknowledgement threshold.

1   6.   (Original) The network device-based method of Claim 5 wherein said taking a

2   network packet transmission recovery action further comprises:

3   performing a fast retransmit upon said comparing said excess number of duplicate

4   acknowledgements with a duplicate acknowledgement threshold indicating

5   that said excess number of duplicate acknowledgements is greater than or

6   equal to said duplicate acknowledgement threshold.

1   7.   (Original) The network device-based method of Claim 6, wherein said taking a

2   network packet transmission recovery action further comprises:

3   analyzing a size of a congestion window.

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1   8.   (Original) The network device-based method of Claim 7, wherein said taking a

2   network packet transmission recovery action further comprises:

3   resizing said congestion window upon said analyzing said size of said congestion

4   window showing said size is greater than a predefined size.

1   9.   (Original) The network device-based method of Claim 5, wherein said taking a

2   network packet transmission recovery action further comprises:

3   analyzing a size of a congestion window upon said comparing said excess number of

4   duplicate acknowledgements with a duplicate acknowledgement threshold

5   indicating that said excess number of duplicate acknowledgements is less than

6   said duplicate acknowledgement threshold.

1   10.   (Original) The network device-based method of Claim 9, wherein said taking a

2   network packet transmission recovery action further comprises:

3   resizing said congestion window upon said analyzing said size of said congestion

4   window showing said size is greater than a predefined size.

1   11.   (Original) The network device-based method of Claim 1 wherein said method is

2   included in Transmission Control Protocol congestion avoidance.

1   12.   (Currently amended) A network device-based method comprising:

2   determining and retaining, upon receiving acknowledgement of receipt of new data,

3   an excess number of duplicate acknowledgements, wherein the excess number

4   of duplicate acknowledgements is a number that represents an amount of

5   duplicate acknowledgements and is based upon a count of consecutive

6   duplicate acknowledgement packets;

7   deflating a congestion window upon said value of said excess number of duplicate

8   acknowledgements being less than a transmission control protocol sender

9   segment; and

10   optimizing a size of said congestion window to match a reduction in a quantity of

11   unacknowledged data upon said excess number of duplicate

12   acknowledgements being greater than a transmission control protocol sender

13   segment.

1   13.   (Original) The network device-based method of Claim 12 wherein a value of the

2   excess number of duplicate acknowledgements is a count of bytes in the duplicate

3   acknowledgements used to determine the excess number of duplicate

4   acknowledgements and further comprising:

5   comparing said excess number of duplicate acknowledgements with a duplicate

6   acknowledgement threshold upon said excess number of duplicate

7   acknowledgements in bytes being greater than a number of bytes in a TCP

8   sender segment.

1   14.   (Original) The network device-based method of Claim 13 further comprising:

2   performing a fast transmit upon said comparing said excess number of duplicate

3   acknowledgements with a duplicate acknowledgement threshold indicating

4   that said excess number of duplicate acknowledgements is greater than or

5   equal to said duplicate acknowledgement threshold.

1   15. (Original) The network device-based method of Claim 14 further comprising:

2   analyzing a size of said congestion window.

1   16. (Original) The network device-based method of Claim 15 further comprising:

2   resizing said congestion window upon said analyzing said size of said congestion

3   window showing said size is greater than a predefined size.

1   17. (Original) The network device-based method of Claim 12 further comprising:

2   analyzing a size of said congestion window upon said comparing said excess number

3   of duplicate acknowledgements with a duplicate acknowledgement threshold

4   indicating that said excess number of duplicate acknowledgements is less than

5   said duplicate acknowledgement threshold.

1   18. (Original) The network device-based method of Claim 17 further comprising:

2   resizing said congestion window upon said analyzing said size of said congestion

3   window showing said size is greater than a predefined size.

1   19. (Original) The network device-based method of Claim 12 wherein said method is

2   included in Transmission Control Protocol congestion avoidance.

1   20. Cancelled.

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1   21.   (Currently amended) A network device comprising:

2   a processor; and

3   a memory coupled to said processor, and storing a fast recovery extended method

4   wherein upon execution of said fast recovery extended method by said processor,

5   causes said network device to:

6   determine, upon receiving acknowledgement of receipt of new data, an excess

7   number of duplicate acknowledgements, wherein the excess number of

8   duplicate acknowledgements is a number that represents an amount of

9   duplicate acknowledgements and is based upon a count of consecutive

10   duplicate acknowledgement packets;

11   retain said excess number of duplicate acknowledgements in said memory;

12   and

13   take a network packet transmission recovery action based upon said excess

14   number of duplicate acknowledgements.

1   22.   (Canceled)

1   23.   (Previously amended) The network device of Claim 21, wherein said fast recovery

2   extended method further comprises:

3   determining whether a congestion window is inflated prior to deciding whether to

4   determine said excess number of duplicate acknowledgements.

1   24.   (Currently amended) The network device of Claim 21, wherein a value of the excess

2 number of duplicate acknowledgements is a count of bytes in the duplicate

3 acknowledgements used to determine the excess number of duplicate

4 acknowledgements and wherein said taking a network packet transmission recovery

5 action further comprises:

6 deflating a congestion window upon said value of said excess number of duplicate

7 acknowledgements in bytes being less than a number of bytes in a

8 transmission control protocol sender segment.

1 25. (Previously amended) The network device of Claim 21, wherein said taking a

2 network packet transmission recovery action further comprises:

3 optimizing a size of a congestion window to match a reduction in a quantity of

4 unacknowledged data upon said excess number of duplicate

5 acknowledgements being greater than a TCP sender segment.

1 26. (Previously amended) The network device of Claim 21, wherein said taking a

2 network packet transmission recovery action further comprises:

3 comparing said excess number of duplicate acknowledgements with a duplicate

4 acknowledgement threshold.

1 27. (Original) The network device of Claim 26 wherein said taking a network packet

2 transmission recovery action further comprises:

3 performing a fast retransmit upon said comparing said excess number of duplicate

4 acknowledgements with a duplicate acknowledgement threshold indicating

5   that said excess number of duplicate acknowledgements is greater than or

6   equal to said duplicate acknowledgement threshold.

1 28.   (Original) The network device of Claim 27, wherein said taking a network packet

2   transmission recovery action further comprises:

3   analyzing a size of a congestion window.

1 29.   (Original) The network device of Claim 28, wherein said taking a network packet

2   transmission recovery action further comprises:

3   resizing said congestion window upon said analyzing said size of said congestion

4   window showing said size is greater than a predefined size.

1 30.   (Original) The network device of Claim 26, wherein said taking a network packet

2   transmission recovery action further comprises:

3   analyzing a size of a congestion window upon said comparing said excess number of

4   duplicate acknowledgements with a duplicate acknowledgement threshold

5   indicating that said excess number of duplicate acknowledgements is less than

6   said duplicate acknowledgement threshold.

1 31.   (Original) The network device of Claim 30, wherein said taking a network packet

2   transmission recovery action further comprises:

3   resizing said congestion window upon said analyzing said size of said congestion

4   window showing said size is greater than a predefined size.

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1 32. (Previously amended) The network device of Claim 21, wherein said method is

2   included in Transmission Control Protocol congestion avoidance.

1 33. (Currently amended) A programmable memory including a fast recovery extended

2   method wherein said fast recovery extended method upon execution comprises:

3   determining and retaining, upon receiving acknowledgement of receipt of new data,

4   an excess number of duplicate acknowledgements, wherein the excess number

5   of duplicate acknowledgements is a number that represents an amount of

6   duplicate acknowledgements and is based upon a count of consecutive

7   duplicate acknowledgement packets; and

8   taking a network packet transmission recovery action based upon said excess number

9   of duplicate acknowledgements.

1 34. Cancelled.

1 35. (Currently amended) A network device comprising:

2   means for determining, upon receiving acknowledgement of receipt of new data, an

3   excess number of duplicate acknowledgements, wherein the excess number of

4   duplicate acknowledgements is a number that represents an amount of duplicate

5   acknowledgements and is based upon a count of consecutive duplicate

6   acknowledgement packets;

7

7   means for retaining said excess number of duplicate acknowledgements; and

8   means for taking a network packet transmission recovery action based upon said excess

9   number of duplicate acknowledgements.

1   36.   (New) A method for recovery of multiple transmission units comprising:

2   transmitting a plurality of transmission units from a sender to a receiver,

3   wherein the receiver is an entity that is currently receiving transmission units,

4   and

5   wherein the sender is an entity that is currently sending the transmission units;

6   the receiver transmitting acknowledgements of receipt of the transmission units

7   received;

8   setting a duplicate acknowledgements threshold, wherein a duplicate

9   acknowledgement is an acknowledgement of receipt of a transmission unit for

10   which an acknowledgement already exists;

11   setting a size for a congestion window;

12   determining a value representing a count of consecutive duplicate acknowledgements;

13   if the value is equal to the duplicate acknowledgement threshold,

14   performing a first fast retransmit operation in which at least one of the

15   transmission units is retransmitted, and

16   resizing the size of the congestion window;

17   determining whether any subsequent duplicate acknowledgements were received;

18   in response to receipt of each of the subsequent duplicate acknowledgements,

19   increasing the size of the congestion window, and

20   if transmitting another segment is permitted, transmitting another segment;

21   and

22   when an acknowledgement for the transmission unit that was retransmitted is

23   received,

24   performing a fast recovery including at least

25   a get excess operation which at least

26   determines a value representing an excess number of duplicate

27   acknowledgements based upon the value of the count of

28   consecutive duplicate acknowledgements for the

29   retransmitted transmission units,

30   a recovery action operation, in which at least the sender initiates one or

31   more network packet transmission recovery actions based upon

32   the excess duplicate acknowledgements, wherein the network

33   packet transmission recovery actions include at least

34   taking no further action,

35   deflating the size of the congestion window,

36   resizing the size of the congestion window to a more

37   optimal size,

38   performing another fast retransmit,

39   resizing the size of the congestion window from the

40   more optimal size, and

41   resizing the size congestion window after the deflating,

42   and

43   a set duplicate acknowledgment operation in which at least the value

44   representing the count of the duplicate acknowledgements is

45   set equal to the value representing the excess duplicate

46   acknowledgements.

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